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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/512,149	02/23/00	AGARWAL	V MI22-1322

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EXAMINER

PIZARRO CRESPO, M

ART UNIT

PAPER NUMBER

2814

DATE MAILED:

10  
05/02/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

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<b>Office Action Summary</b>	Application No. 09/512,149	Applicant(s) AGARWAL, VISHNU K	
	Examiner Marcos D. Pizarro-Crespo	Art Unit 2814	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 March 2001.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 4-16 ~~is~~ are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 4-16 ~~is~~ are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. § 119**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

**Attachment(s)**

- |  |  |
|--|--|
| 15) <input type="checkbox"/> Notice of References Cited (PTO-892)                                | 18) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 16) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 19) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 17) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____    | 20) <input type="checkbox"/> Other: _____                                    |

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Attorney's Docket Number: MI22-1322

Filing Date: 4/24/2000

Claimed Foreign Priority Date: none

Applicant(s): Agarwal

Examiner: Marcos D. Pizarro-Crespo

### **DETAILED ACTION**

This office action is in response to the amendment A filed 3/5/2001 (paper no. 9).

#### ***Acknowledgment***

1. The amendment A filed on 3/5/2001, paper no. 9, in response to the office action mailed on 11/9/2000, paper no. 7, has been entered. The present office action is made with all the suggested amendments being fully considered. Accordingly, pending in this office action are claims 1 and 4-16.

#### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 4-9, 11, 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson (US 5,390,072) in view of Shimizu (US 4,873,610).

4. Anderson shows most aspects of the instant invention including an integrated circuitry comprising (fig.2):

- A first capacitor electrode 20

- A second capacitor electrode **24**
- A high dielectric constant layer between the capacitor electrodes comprising:
  - An amorphous material layer **22**
  - A crystalline material layer **23** over the amorphous material layer **22**

(col.2/II.49-54, col.6/II.47-53)

However, Anderson does not show the amorphous material layer and the crystalline layer constituting different chemical compositions. Shimizu discloses an invention relating to dielectric materials suitable to be used in capacitors (col.1/II.10-12). Furthermore, Shimizu teaches that by using at least two different dielectric materials in a condenser a sufficient high permittivity can be obtained, but also the dependence of permittivity upon temperature can be controlled (col.2/II.8-11,13-24; col.4/II.60-68). It would have been obvious at the time of the invention to one of ordinary skill in the art to have different chemical compositions between the amorphous and the crystalline dielectric layer in the capacitor disclosed by Anderson, as suggested by Shimizu, because such a modification will allow to control the dependence of permittivity upon temperature for the dielectric region.

5. Regarding claim 4, Anderson teaches that the upper and lower electrodes generally comprise a suitably conductive metallic oxide or a metal (col.3/II.14-18).

6. Regarding claims 5-9, 11 and 13-14, figure 2 shows a capacitor over a semiconductor substrate **21**, a dielectric layer received between two capacitor plates **20** **24**, an amorphous dielectric material **22** contacting one capacitor plate **20**, a crystalline dielectric material **23** contacting a second capacitor plate **24**, wherein the dielectric

region is the only capacitor dielectric region received between the capacitor electrodes  
**20 24.**

7. Regarding claim 15, Anderson discloses one embodiment of a capacitor being received over a semiconductor substrate with a high dielectric-constant amorphous layer between the substrate and a high dielectric-constant crystalline layer (col.2/ll.49-57).

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson, in view of Shimizu, as applied to claim 1 above, and further in view of Ramakrishnan (US 5,943,580).

9. Anderson, in view of Shimizu, shows most aspects of the instant invention but a capacitor wherein the amorphous dielectric material and the crystalline dielectric material is at least 98% amorphous and 98% crystalline, respectively (see paragraphs 4-7). Ramakrishnan teaches a method of forming capacitors on semiconducting substrates having insulating films with high-dielectric constants (col.1/ll.6-9). Ramakrishnan also teaches that by controlling the thermal treatment process the degree of crystallinity of the dielectric layer can be controlled and by doing so one is able to create capacitors with a suitable value of dielectric constant on a single substrate (col.2/ll.65-col.3/ll.16). Moreover, Ramakrishnan teaches that by controlling the dielectric constant one is able to control the capacitance of the condenser (col.4/ll.24-40). Accordingly, it would have been an obvious matter of design choice to select the degree of crystallinity for the amorphous and the crystalline dielectric layer as taught by Ramakrishnan, since the degree of crystallinity of the dielectric layer is a

variable of importance that allows to control the capacitance of the condenser. Therefore, it would have been obvious at the time of the invention to one of ordinary skill in the art to select suitable degrees of crystallinity for the amorphous and crystalline dielectric layer of Anderson, in view of Shimizu, as taught by Ramakrishnan, according to the desired capacitance for the condenser.

10. Claims 12 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson, in view of Shimizu, as applied to claim 1 above, and further in view of Graettinger (US 5,844,771).

11. Anderson, in view of Shimizu, shows most aspects of the instant invention but a capacitor wherein the semiconductor substrate comprises bulk monocrystalline silicon (see paragraphs 4-7). Graettinger teaches that in the processing of integrated circuits the wafer substrate typically comprises monocrystalline silicon (col.1/ll.20-24). It would have been obvious at the time of the invention to one of ordinary skill in the art to have monocrystalline silicon in the capacitor of Anderson, in view of Shimizu, as suggested by Graettinger, because in the processing of integrated circuits the wafer substrate is typically monocrystalline silicon.

### ***Response to Arguments***

12. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a high K substantially crystalline material received over a high K substantially amorphous material in a capacitor dielectric region) were not previously recited in the rejected claims. The claims now specify that the high K substantially crystalline material

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is received over the high K substantially amorphous material. Anderson clearly discloses this feature. See, for example, figure 2, where a crystalline material layer **23** is received over an amorphous material layer **22** (col.2/ll.49-54, col.6/ll.47-53).

13. In response to applicant's arguments that the structure claimed by the applicant would not be obvious over Anderson, in view of Shimizu, because although Shimizu discloses a high K capacitor dielectric region comprising two different compositions, it does not disclose or suggest forming their region of different phases as Anderson does, it is noted that "The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference...Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). See also *In re Nievelt*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973) ("Combining the teachings of references does not involve an ability to combine their specific structures."). In the instant case, Anderson shows a crystalline dielectric layer **23** disposed over an amorphous dielectric layer **22** (fig.2, col.2/ll.49-54, col.6/ll.47-53). On the other hand, Shimizu teaches that by using at least two different dielectric materials in a condenser a sufficient high permittivity can be obtained, but also the dependence of permittivity upon temperature can be controlled (col.2/ll.8-11,13-24; col.4/ll.60-68). It would have been obvious at the time of the invention to one of ordinary skill in the art to have different chemical compositions between the amorphous and the crystalline dielectric layer in the capacitor disclosed by Anderson, as suggested

by Shimizu, because such a modification will allow to control the dependence of permittivity upon temperature for the dielectric region.

***Conclusion***

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

15. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center located in Crystal Plaza 4, room 4C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Marcos D. Pizarro-Crespo** at **(703) 308-6558** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through

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Friday or by e-mail via [Marcos.Pizarro@uspto.gov](mailto:Marcos.Pizarro@uspto.gov). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.


Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.

17. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/310, 438/240, 361/313	4/30/2001
Other Documentation:	
Electronic Database(s): EAST (USPAT, EPO, JPO)	4/30/2001

**Marcos D. Pizarro-Crespo**  
Patent Examiner  
Group Art Unit 2814

MDP/mdp  
10/16/2000

  
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